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Filed : July 10, 2003

### REMARKS

The foregoing amendments and the following remarks are responsive to the February 9, 2006 Final Office Action and the April 20, 2006 Notice of Non-Compliant Amendment. Claims 1, 15, and 49-51 remain as previously presented, Claims 2-14 remain as originally filed, Claims 16-48 are cancelled without prejudice, and Claims 52-57 are added. Thus, Claims 1-15 and 49-57 are presented for further consideration.

#### **Comments on the April 20, 2006 Notice of Non-Compliant Amendment**

In the April 20, 2006 *Notice of Non-Compliant Amendment*, the Examiner refers to Applicant's *Amendment and Response to the February 9, 2006 Final Office Action* and states that "nonelected claims 17-28 are not canceled in the claims listing even though applicant's remarks indicate this set of claims are canceled." Applicant thanks Examiner Chiem for extending the courtesy of speaking with Applicant's representative, Bruce S. Itchkawitz, on May 3, 2006 when Mr. Itchkawitz called the Examiner to point out that the claim listing and Applicant's remarks in the *Amendment and Response to the February 9, 2006 Final Office Action* were consistent with one another that Claims 17-28 were withdrawn and were not canceled. The Examiner pointed out that the March 24, 2005 *Restriction Requirement* identified two species and that in the April 27, 2005 *Response to Restriction Requirement*, Applicant elected with traverse to prosecute the claims directed to Species I (Claims 2-11). The Examiner further pointed out that in the February 9, 2006 *Final Office Action*, the Examiner had stated that Claims 16-48 were drawn to an invention nonelected with traverse and that a complete reply to the final rejection must include cancellation of the nonelected claims. The Examiner stated that April 20, 2006 *Notice of Non-Compliant Amendment* was sent because the *Amendment and Response to the February 9, 2006 Final Office Action* did not cancel these claims.

Applicant respectfully submits that only Claims 16-22 are directed to the non-elected Species II, and that Claims 23-48 are generic to both Species I and II identified in the March 24, 2005 *Restriction Requirement*, as are Claims 1, 12-15, and 49-51. Applicant has canceled Claims 16-48 without prejudice, reserving the right to pursue allowance of these claims in continuation or divisional applications. Therefore, Applicant respectfully submits that this *Revised Amendment and Response to the February 9, 2006 Final Office Action* corrects the apparent deficiency in Applicant's earlier response and is compliant pursuant to 37 C.F.R. § 1.121.

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### **Request for Entry**

As described herein, Applicant has cancelled Claims 16-48 without prejudice. Applicant submits that the cancellation of Claims 16-48 without prejudice reduces the issues and focuses prosecution. Applicant also submits that each of new Claims 52-55 depends from Claim 2, Claim 56 depends from Claim 55, and Claim 57 depends from Claim 56, so each of new Claims 52-57 is a member of the elected Species I. Applicant further submits that the subject matter of new Claims 52-57 is disclosed in the originally-filed application, so new Claims 52-57 do not introduce new matter. Applicant respectfully requests the Examiner to enter the amendments and to reconsider the pending claims in view of the following remarks.

### **Response to Rejection of Claims 1, 2, 10-15, and 49-51 Under 35 U.S.C. § 103(a)**

In the February 9, 2006 Final Office Action, the Examiner rejects Claims 1, 2, 10-15 and 49-51 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,773,759 issued to Bergh et al. ("Bergh") in view of U.S. Patent No. 6,389,187 B1 issued to Greenaway et al. ("Greenaway"). As discussed below, Applicant submits that Claims 1, 2, 10-15, and 49-51 are patentably distinguished over Bergh in view of Greenaway.

#### Claim 1

As previously presented, Claim 1 recites (emphasis added):

1. An optical sensor comprising:
  - a light source having an output that emits a first optical signal;
  - a first directional coupler comprising at least a first port, a second port and a third port, the first port optically coupled to the light source to receive the first optical signal emitted from the light source, the first port optically coupled to the second port and to the third port such that the first optical signal received by the first port is split into a second optical signal output by the second port and a third optical signal output by the third port;
  - a **hollow-core** photonic-bandgap fiber having a **hollow core** surrounded by a cladding, the hollow-core photonic-bandgap fiber optically coupled to the second port and to the third port to form an optical loop such that the second optical signal and the third optical signal counterpropagate through the hollow-core photonic-bandgap fiber and return to the third port and the second port, respectively, the cladding of the hollow-core photonic-bandgap fiber substantially confining the counterpropagating second optical signal and third optical signal within the hollow core; and
  - an optical detector located at a position in the optical sensor to receive the counterpropagating second and third optical signals after the second and third optical signals have traversed the hollow-core photonic-bandgap fiber.

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Applicant submits that the combination of Bergh with Greenaway does not disclose or suggest all the limitations of Claim 1. For example, neither Bergh nor Greenaway discloses or suggests “a hollow-core photonic-bandgap fiber having a hollow core surrounded by a cladding, the hollow-core photonic-bandgap fiber optically coupled to the second port and to the third port to form an optical loop,” as recited by Claim 1.

The Examiner acknowledges that Bergh does not disclose or suggest that the optical fiber loop comprises a “hollow-core photonic-bandgap fiber” as recited by Claim 1, but cites Greenaway for disclosing such a hollow-core photonic-bandgap fiber. In particular, in support of this assertion, the Examiner cites Greenaway at column 4, lines 29-35 and 44-45:

Such fibres are known and comprise multiple fibre cores, each with an associated cladding “region”. Each cladding region is smaller in cross-sectional area than would be required for typical cladding of cylindrical symmetry. This enables the cores to be more closely spaced than previously permitted, with regard to the requirements for avoiding crosstalk.

...

Alternatively, the multicored fibre may be a photonic crystal fibre.

Applicant submits that Greenaway, including the passage cited by the Examiner, does not disclose or suggest a “hollow-core photonic-bandgap fiber having a hollow core” as recited by Claim 1. While Greenaway discloses that a “photonic crystal fibre” may be used, Greenaway is silent regarding a **hollow-core** photonic-bandgap fiber having a **hollow core**. Applicant submits that the term “photonic crystal fibre” used by Greenaway is a broad term which includes fibers having solid cores and fibers having hollow cores. Therefore, the term “photonic crystal fibre” does not inherently refer to a hollow-core photonic-bandgap fiber.

This interpretation is consistent with the definition provided by the Examiner with the February 9, 2006 Final Office Action that according to “The Free Dictionary by Farlex,” the term “photonic crystal fiber” refers to fibers which (emphasis added):

have a cross-section (normally uniform along the fiber length) microstructured from two or more materials, most commonly arranged periodically over much of the cross-section, usually as a “cladding” surrounding a core (or several cores) where light is confined. For example, the fibers first demonstrated by Russell consisted of a hexagonal lattice of air holes in a **silica fiber, with a solid (1996) or hollow (1998) core at the center where light is guided.**

...

Such fibers can be divided into two modes of operation, according to their mechanism for confinement. **Those with a solid core** ... can operate on the same index-guiding principle as conventional optical fiber ... **Bandgap fibers with hollow cores** can potentially circumvent limits imposed by available materials ... .

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Because the term “photonic crystal fibre” used by Greenaway can refer to both solid-core fibers and hollow-core photonic-bandgap fibers, Applicant submits that Greenaway can not be relied upon for the disclosure of a “hollow-core photonic-bandgap fiber having a hollow core,” as recited by Claim 1. Therefore, Applicant submits that the combination of Bergh in view of Greenaway does not disclose or suggest all the limitations of Claim 1.

Furthermore, Applicant submits that the prior art does not provide a motivation to modify the disclosure of Bergh to utilize a hollow-core photonic-bandgap fiber having a hollow core. The Examiner states that Greenaway discloses that photonic bandgap fibers have characteristics (*e.g.*, high transmission efficiency, compact size, reduced crosstalk, low sensitivity to temperature) that provide a motivation for using such fibers with the configuration disclosed by Bergh. However, Applicant submits that at column 4, lines 28-43, Greenaway actually attributes most of these characteristics to multicore fibers, not to photonic crystal fibers. At column 4, lines 44-49, Greenaway discloses that photonic crystal fibers can provide the advantages of compactness and of keeping crosstalk between the cores of a multicore fiber to an acceptable level. However, neither Bergh nor Greenaway discloses or suggests that either of these characteristics would be beneficial to the configuration disclosed by Bergh. Therefore, Applicant submits that neither Bergh nor Greenaway provides a motivation to use photonic crystal fibers in the configuration disclosed by Bergh.

For at least the foregoing reasons, Applicant submits that Claim 1 is patentably distinguished over the combination of Bergh in view of Greenaway. Applicant respectfully requests that the Examiner withdraw the rejection of Claim 1 and pass this claim to allowance.

Claims 2, 10-15, and 49-51

Each of Claims 2, 11, 12, 14, and 49 depends from Claim 1, Claim 10 depends from Claim 2, Claim 13 depends from Claim 12, Claim 15 depends from Claim 14, and each of Claims 50 and 51 depends from Claim 49. Therefore, each of Claims 2, 10-15, and 49-51 includes all the limitations of Claim 1 as well as other limitations of particular utility. For at least the reasons stated above with regard to Claim 1, Applicant submits that Claims 2, 10-15, and 49-51 are patentably distinguished over the combination of Bergh in view of Greenaway. Applicant respectfully requests that the Examiner withdraw the rejection of Claims 2, 10-15, and 49-51 and pass these claims to allowance.

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**Response to Rejection of Claims 3-9 Under 35 U.S.C. § 103(a)**

In the February 9, 2006 Final Office Action, the Examiner rejects Claims 3-9 under 35 U.S.C. § 103(a) as being unpatentable over Bergh in view of Greenaway and further in view of U.S. Patent No. 6,108,086 issued to Michal et al. ("Michal").

As described above, Applicant submits that the combination of Bergh in view of Greenaway does not disclose or suggest all the limitations of Claim 1 and does not provide a motivation to combine Bergh and Greenaway. Applicant further submits that Michal does not disclose or suggest the limitations of Claim 1 which are not disclosed or suggested by Bergh in view of Greenaway, and that Michal does not disclose or suggest a motivation to combine Bergh, Greenaway, and Michal. Therefore, Applicant submits that Claim 1 is patentably distinguished over the combination of Bergh, Greenaway, and Michal.

Claim 3 depends from Claim 2 which depends from Claim 1. Each of Claims 4-9 depends from Claim 3. Therefore, each of Claims 3-9 includes all the limitations of Claim 1 as well as other limitations of particular utility. For at least the reasons stated above, Applicant submits that Claims 3-9 are patentably distinguished over the combination of Bergh, Greenaway, and Michal. Applicant respectfully requests that the Examiner withdraw the rejection of Claims 3-9 and pass these claims to allowance.

**Summary**

For the foregoing reasons, Applicant submits that Claims 1-15 and 49-57 are in condition for allowance, and Applicant respectfully requests such action.


Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

Dated: \_\_\_\_\_

5/4/06

By: \_\_\_\_\_

  
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